COSTS, COMPETITION, AND OUTCOMES IN THE END-STAGE RENAL DISEASE PROGRAM

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EXECUTIVE SUMMARY

Purpose

This project was designed to investigate the role of economic and other forces on Medicare's End-Stage Renal Disease (ESRD) Program. Specifically, this project focused on the role of market forces, the Health Care Financing Administration's (HCFA) reimbursement policies and basic epidemiological and demographic forces, on cost and outcomes in Medicare's program for patients with chronic kidney failure.

Medicare's role in the End-Stage Renal Disease Program was dramatically expanded by an Act of Congress in 1973. At that time, legislation was passed that brought approximately 90 percent of all patients, regardless of age, with chronic kidney failure into the Medicare insurance program (the 10 percent of patients not covered by Medicare are those persons outside of the Social Security System such as farmers). Since that time, the program has grown to the point that in 1984 there were 78,483 beneficiaries at a total cost of approximately $1.8 billion. While the renal program is a very focused subset of Medicare, the program is in many ways a microcosm of the U.S. health care industry. Although this program is a subset of Medicare it has a distinct difference that expands the applicability of research results: persons of all ages are included. This provides a strong advantage for analysis and generalization of results.

The initial proposal for this project (Table 1) focused on:

- conceptual consideration of models of behavior for both providers and patients;
- the development of appropriate data sources including a major primary data collection effort to test these models;
- an empirical series of hypothesis tests using these data.

These tasks were all achieved and have led to a series of articles and other research products (Table 2).

In addition to these basically empirical tasks, reasonably early in the project it became clear that another major role could be filled by this grant. While competition was a "buzz word" in Washington policy circles at that time, there had been little if any specific development of this concept as it might apply to the End-Stage Renal Disease Program. Subsequently, this project took on the role of applying the basic notions of competition in health care to the End-Stage Renal Disease Program. This role included applying the general competitive model to the End-Stage Renal Disease Program and providing the details of just how competitive concepts might specifically apply to the End-Stage Renal Disease Program. This led to a series of publications that have become the standard references for understanding the

Table 1

Summary of Background, Purpose, Scope and Major Findings
Costs, Competition and Outcomes in the ESRD Program

Grant Description	Remarks
Background	
Since 1973, Medicare has insured over 90% of the U.S. population, of all ages, with End-Stage Renal Disease (ESRD). Coverage includes Medicare's full range of medical services, although dialysis and transplantation are the two therapies requiring the greatest spending. With an initial enrollment of 16,000 in 1974, the enrollment grew to 78,483 in 1984.	Major exception to Medicare coverage is outpatient drugs. Total Medicare costs per year grew from $229 million in 1974 to $1.8 billion in 1984. While the ESRD program by definition includes only those with kidney failure, the program is in many ways a microcosm of the entire U.S. health financing and delivery system.
Purpose	
1. To analyze the determinants of ESRD provider and program costs and patient outcomes.	1. Costs were as defined by Medicare. Outcomes were measured by survival and inpatient use.
2. To assess the current and potential impact of competition on both costs and outcomes.	2. Price competition is generally not present in this market. Non-price competition is more likely.
3. To consider alternative fiscal concepts for reimbursement policy.	3. Not in original proposal but subsequently added to project by grantee.
4. To design, implement, and service various data functions for the ESRD Data Systems.	4. Not in original proposal but subsequently added to project by HCFA.
Scope	
1. To develop basic economic models of behavior for both patients and providers.	1. Models of non-price competition developed for other similar markets such as airlines were useful.

Table 1 (continued)

Grant Description	Remarks
2. To assemble, merge, and clean relevant data from HCFA files that would permit empirical testing of hypotheses related to provider and patient behavior.	2. The basic inputs were the ESRD Medicare Management Information System; all medical claims; Facility Surveys; Cost and Statistical Surveys.
3. To collect primary data in support of items 1 and 2 above.	3. HCFA data does not contain information on patient amenities, physician financial incentives, and information on patient acceptance policy by providers.
4. To supply ESRD data to HCFA for transfer to other grantees.	4. Major data files were provided for Batelle and for Brandeis grantees.
5. To develop and implement a process for cleaning, annualization, and common format for all HCFA ESRD data covering 1973-1982.	5. Process provided a rich archival file covering first 10 years of ESRD program.
Results and Important Findings	
1. Empirically we were able to demonstrate that more competition in the dialysis market leads to more benefits for patients at no extra cost to the government. This was the first such finding in all health economic research.	1. This finding also implies that the same services could be bought for less cost in competitive markets. Published in Journal of Health Economics. There was some indication that non-profits make more profit than for-profit dialysis units.
2. Competition, as a conceptual basis for a decentralized efficient system, could be defined and modeled in the ESRD context.	2. Published in Seminars in Nephrology and in a Federal Trade Commission Report. Many aspects of competition have much conceptual appeal but have not been tested.
3. "Pro-competitive" policy could take many forms. Important choices among alternatives exist, and implementation could be complex. Moreover, competition alone cannot determine appropriate level of public support.	3. A competitive ESRD program may be economically efficient, but it does not remove the need for policy choices about how generous the program should be for patients.

Table 1 (continued)

Grant Description	Remarks
4. Both conceptually and empirically, we were able to develop a set of casemix indicators that could be useful in developing mechanisms that link capitation-like payment to expected cost.	4. Indicators include age, sex, primary and secondary diagnoses, length of time since first dialysis treatment.
5. Other cost analyses (1977-1981) showed:	5. Articles are under review.
a. Payment policy is likely to determine provider and hence program costs.	a. Contrary to conventional wisdom that provider costs determine program spending.
b. Home hemodialysis produces little or no savings for Medicare or for dialysis units supervising home care.	b. Counter to conventional wisdom. Could have major impact on policy.
c. Economies of scale in dialysis appear to be substantial.	c. Could have major implication for policy.
d. Medicare appears to have shared in financial savings from reuse of dialyzers.	d. Reuse probably contributed to providers' ability to remain below the "screen" price (pre-composite rate).
e. Reuse of dialyzers did not lead to higher inpatient costs.	e. Has potential impact on the assessment of the efficacy of dialyzer reuse.
f. Open staffing of dialysis units for nephrologists may increase costs.	f. Open staffing can have benefits for competition and patient choice.
g. Capitation of nephrologists appears to lower Medicare costs.	g. Consistent with subsequent HCFA policy to require capitation by nephrologists.
h. Tight physician financial incentives in dialysis units can lead to higher Medicare costs.	h. Contrary to most expectations but has been shown in other situations as well.

Table 1 (continued)

Grant Description	Remarks
i. Certificate of need and other supply side constraints are likely to lead to inefficiency in dialysis units.	i. Limitations on the number of dialysis stations is the primary impediment to achieving least-cost production.
6. Results from analysis of survival for dialysis patients (1977-1981) included:	6. Article is under revision after professional review.
a. Dramatically higher death rates for patients with diabetes.	a. Previously reported but not shown with controlled, multivarate analysis.
b. Blacks have lower mortality than whites with renal failure.	b. Most unusual result when compared to non-ESRD population.
c. Lower death rates in large compared to small dialysis units.	c. Combined with lower costs for larger units has potential impact for policy.
d. Reuse of dialyzers did not appear to affect patient survival.	d. Analysis was restricted to units that were long-term reusers or that never reused.
e. More or less competition did not appear to affect patient survival.	e. Competition appears to have its effect on patient amenities but not on patient survival.
7. Analyses of incidence rates of renal failure showed that:	7. Article is in draft.
a. The Medicare program has been generally successful in eliminating income differences in access to treatment for chronic renal failure.	a. Undoubtedly a major goal of original legislation.
b. Basic indicators of need are correlated with incidence rates.	b. Death rates from a prior period for renal related conditions were used as a measure of need.

Table 1 (continued)

Grant Description	Remarks
c. Diabetes is becoming increasingly important in determining the composition of the ESRD population.	c. Has implications for understanding the likely long-term cost of catastrophic insurance. Diabetics were not initially treated in the program but successful treatment experience expanded the target population beyond original expectations.
8. Analyses of 1981 use of CAPD showed:	8. Published in Health Affaris. this was for early use of CAPD.
a. CAPD and the predominant therapy of in-center hemodialysis have similar one year survival rates.	a. With other covariates equal, patients with higher risk diabetes are more likely to be on CAPD.
b. CAPD patients have dramatically higher use of inpatient care.	b. Whether this is caused by CAPD or preselection of more severe cases into CAPD could not be determined under this grant.
c. Home dialysis has a younger and more healthy mix of patients than does in-center hemodialysis.	c. While previously suspected, this analysis confirmed the hypotheses.
9. Analysis of the availability of evening dialysis showed that in 1982:	9. Published in HCFA Review. The availability of eveing dialysis is frequently linked to a patient's likelihood of returning to work.
a. Most patients had access to evening dialysis whether in their own unit or a unit in the same market.	
b. There is a tradeoff between a unit offering home dialysis and evening dialysis.	
c. Units offering home dialysis tend to be quite large.	c. Helps to explain why home dialysis is not as available as some would like.

Table 1 (continued)

Grant Description	Remarks
10. The analysis of costs and outcomes in kidney transplantation showed: a. There appear to be little, if any, economies of scale in kidney transplantation, i.e., costs per transplant were not lower in larger transplant centers. b. There were no systematic differences in outcomes (patient and graft survival) across transplant programs of different sizes.	10. Analysis was initiated under this grant and has continued under another HCFA grant.

Table 2

Publications and Other Research Products

Focus and Results	Publications/Remarks
1. Conceptual basis for applying competitive principles to ESRD program: Supply side changes including capitation; restraints on supply; some bidding; Demand side changes including vouchers; Reimbursement mechanisms.	a. "Pro-Competition Health Insurance Proposals and Their Implications for Medicare's End-Stage Renal Disease Program," Randall R. Bovbjerg, Philip J. Held, and Mark V. Pauly, Seminars in Nephrology, vol. 2, no. 2 (June 1982). b. Medicare's End Stage Renal Disease Program: How a More Competitive Approach Would Address Important Policy Issues, Randall R. Bovbjerg, Philip J. Held and Mark V. Pauly. Federal Trade Commission report, August 1983. Financed jointly by HCFA and FTC.
2. Empirical investigations into the role of market forces and HCFA policy choices in the ESRD program.	a. "Competition and Efficiency in the End-Stage Renal Disease Program," Philip J. Held and Mark V. Pauly, Journal of Health Economics, 2 (1983). b. "Charging the Victim: An Evaluation of Reimbursement Policy in the U.S. End-Stage Renal Disease Program," Philip J. Held and Mark V. Pauly, in Social Policy Evaluation, edited by E. Helpman et al. (Academic Press, 1983). c. "CAPD and the Debate over Efficacy and Cost—Some Preliminary Evidence," Randall Bovbjerg, Louis Diamond, Philip J. Held, and Mark V. Pauly, Health Affairs, Summer 1983. d. "How Available are Evening Dialysis Services?" Philip J. Held and Victoria Alexander, Health Care Financing Review, Winter 1985/Volume 7, Number 2.

Table 2 (continued)

Focus and Results	Publications/Remarks
3. Case Mix and Costs	"Patient Severity Measures and Their Impact on Medicare Costs in the ESRD Program," by Philip J. Held and Mark V. Pauly. Urban Institute. January 1985. "How to Measure Case Mix Differences." Philip J. Held and Mark V. Pauly. Urban Institute. November 1984. "Developing a Workable Case-Mix Index that relates to Cost: Experience for Patients with Chronic Renal Failure," Louis Diamond, Philip J. Held, and Mary Jo Palumbo. Urban Institute. July 1984. "An Economic Analysis of the Production and Cost of Renal Dialysis Treatments," Philip Held and Mark Pauly. Urban Institute. June 1980, Revised August 1982.
4. ESRD Data Service Functions:	
a. Designed and implemented a series of computer programs to update and annualize the ESRD Data Systems from 1973 through 1982. There were 16.6 million input records and 3.9 million output records.	a. "System Overview for ESRD Inpatient and Skilled Nursing Facility Billing Records (RUS, Part ´A´) Reformat and Annualization," J. Thomas Hutchinson. Urban Institute. February 1985. "System Overview for ESRD Outpatient Billing Records (RUS, Part ´A´) Reformat and Annualization," J. Thomas Hutchinson. Urban Institute. October 1984. "System Overview for ESRD Payment Record (RUS, Part ´B´) Reformrat and Annualization," J. Thomas Hutchinson. Urban Institute. August 1984.

Table 2 (continued)

Focus and Results	Publications/Remarks
b. At HCFA's direction, created major data files destined for other HCFA grantees:	b.
Battelle Memorial Research Center	File contained 141,460 total Part A and Part B records.
Brandeis University	File contained 60,067 Part A and Part B records.
c. File creation for our analysis involved 13.4 million records covering the 1977-1982 period. Based on this experience plus other data tasks, a record of the institutional knowledge gained was produced.	c. "Users Insight into the ESRD Systems Files." V. Alexander and P. Held. Urban Institute. August 1984.

notions of competition as they apply to the End-Stage Renal Disease Program. A summary of the purpose of this grant is contained in Table 1.

Scope

This project developed along three basic lines of activity. The first was an emphasis on the development and testing of economic models of the End-Stage Renal Disease Program. This involved the specification of models of behavior, the construction of supporting data files, and the empirical testing of the models. The focus was on the determinants of costs and the role of economic forces in program outcomes which were measured primarily by incidence of renal failure, and mortality given renal failure. The primary economic forces analyzed included competition in the market for dialysis patients and Health Care Financing Administration reimbursement policies.

A second basic activity of this project was the conceptual consideration of a framework for applying competitive solutions to the End-Stage Renal Disease Program. The scope of this analysis was to consider the entire range of potential policy changes from reduction of certificate-of-need and other supply side considerations to full capitation and vouchers.

A third basic activity of this grant was to develop and implement a system to produce an archival file of medical claims data for the End-Stage Renal Disease Program covering the 1973 to 1982 period. A summary of the scope is contained in Table 1.

Results and Important Findings

The grant has produced a substantial number of publications and an abundant body of knowledge concerning end-stage renal disease patients, providers, and the overall ESRD program. A summary of major findings can be found in Table 1. Additional detail can be found in the Appendices, where the conclusions or abstracts of several of these publications have been reproduced. Table 2 gives a full list of publications and other research products.

The grant has been a tremendous success. All of the original goals have been accomplished, plus two additional major goals. The first addition, made by the grantee, was the development and application of the "competitive model" to the End-Stage Renal Disease Program. The second additional goal was added by HCFA; it was to undertake a series of extensive data file tasks to produce an archival file for all medical claims covering the 1973 through 1982 period, including 16.6 million input records.

In sum, the grant has shown that economic and policy analysis is a powerful tool in understanding the workings of the End-Stage Renal Disease Program. Such analyses have produced the variety of useful information noted in Table 1 and the appendices. Although the program is clearly focused on beneficiaries with a life-threatening condition and who face vital medical issues, economic and other analyses can successfully explain program spending and behavior by providers and patients. Despite the formerly conventional wisdom about catastrophic disease, all our experience under this grant

suggests that both providers and patients respond in a rational fashion to basic economic forces, including the incentives set by government policy.

It is not always obvious exactly what motivates behavior or what all the preferences of patients and providers are. The medical world and the people within it undoubtedly have non-economic motivations that include ethical, legal, and moral concerns. Such influences are subtle and by and large lie outside the direct influence of payment methods and other tools of public policy. But is is clear from the research produced under this grant that the full impacts of government policy can only be understood if program incentives and other economic and market forces are fully considered. This grant laid a firm foundation in findings, in data, and in methodology for ongoing policy-relevant analysis--at HCFA, here at The Urban Institute, and elsewhere.

INTRODUCTION

The End-Stage Renal Disease (ESRD) Program within Medicare covers approximately 80,000 Americans of all ages who suffer from irreversible kidney failure. The therapies provided include dialysis, which includes hemodialysis and peritoneal, and kidney transplantation. Medicare covers most of the cost of these therapies, as well as all other medical services normally covered under usual Medicare policies.

This grant was proposed to the Health Care Financing Administration (HCFA) in the early stages of a new administration whose cornerstone for health policy was the reliance on more market forces. This grant proposed to analyze how market forces, including competition, impinged on the ESRD program. This grant's significant aspects included:

- Focusing on market and economic forces including competition, payment policy and financial incentives facing nephrologists.
- Focusing on the characteristics of the institutions that provide dialysis and transplantation. These characteristics included ownership, profit status, size, location and local wages for medical personnel.
- Focusing on patient characteristics including the development of indicators of casemix severity.
- Focusing on the construction and integration of large data sets that bring to bear all the data collected by HCFA including medical claims as well as clinical indicators of cause and severity of kidney failure.
- Collection of primary data that filled in the incentive and other aspects of provider information that is not captured by HCFA data systems.
- Basing analysis on sound economic theory.
- A research team that had a long track record of economic analysis. Philip J. Held and Mark V. Pauly (Director of the Leonard Davis Institute at the University of Pennsylvania) have been collaborators since 1974; they have focused on the ESRD program since 1978. Randall R. Bovbjerg, a health policy analyst with a legal background joined the effort in the early stages of this grant.

DISCUSSION

The grant produced a number of research papers and other products. See Table 2 above. This section will focus on some of the published articles. More detail on these papers can be found in the appendices.

Research Area One: Alternative Fiscal Concepts (See Table 2 for publications)

Pro Competition Health Insurance Proposals and Their Implications for Medicare's End-Stage Renal Disease Program:

This paper and the similar FTC report were primarily conceptual in approach, but they relied on much of our previous empirical work to add specifics and detail. The focus of these papers was:

- Describe the notions of competitive principles as they apply to health care in general. Include the aspects of supply side changes such as restraints on the number of suppliers, (e.g., certificate of need); the aspects of demand such as coinsurance and deductibles and vouchers.
- Expand these basic notions to the ESRD program. Provide numerous specific examples.
- Define types of competition (e.g., price and non-price); relate these notions to the ESRD program where a government set price precludes price competition among providers.
- Assess how much competition there is in the renal program.

Some examples of the results of these papers follow. Table 3 contains the Herfindahl index calculated under this grant for dialysis markets in the U.S. This is a measure of market concentration and has long been used as a reference for judging how likely is competition in an industry. This grant applied this concept to local markets for dialysis services. Table 4 gives an example of how this information on competition can be used in analysis. Table 5 provides a summary of the pros and cons of competitive principles as they apply to the ESRD program.

Table 3

Distribution of ESRD Market Areas, By Market Concentration, and Market Size, U.S., 1977*

Market Concentration (H Index)	Non-SMSA	SMSA Size (Population)			Total
		LT 300K	LT 500K	GT 500K	
0.0–0.2 (many providers)	0	0	0	15 (20%)	15 (4%)
0.2–0.4	0	2 (2%)	2 (5%)	26 (34%)	30 (8%)
0.4–0.6	1 (1%)	12 (10%)	12 (28%)	13 (17%)	38 (10%)
0.6–0.8	1 (1%)	5 (4%)	6 (14%)	10 (13%)	22 (6%)
0.8–1.0 Monopolistic	129 (90%)	99 (84%)	23 (54%)	13 (17%)	264 (72%)
Total	131 (100%)	118 (100%)	43 (100%)	77 (100%)	369 (100%)

*Data are based on the 1977 Facility Survey (See Reference 3). SMSA is Standard Metropolitan Statistical Area. It was assumed that the relevant market was the SMSA or the county in the case of non-SMSA locations. The H index is the Herfindahl index of market concentration or the sum of the market shares squared. LT is less than; GT is greater than. K is 1000's. In constructing the index, all providers of maintenance dialysis in the market area included.

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Table 4

Indications of Presence or Absence of Competition in Dialysis Markets 1978

Indicator	Remarks
Presence of Competition	
Tests using the H Index of market concentration	
Higher patient amenities accompany lower market shares (i.e., more competition) — hypothesis confirmed.	The actual test was for a higher ratio of dialysis stations to patients, other things equal. The test was restricted to freestanding facilities in larger cities.
Lower "profitability" of dialysis providers accompanies lower market shares (i.e., more competition) — hypothesis confirmed.	The test was performed using a national sample of 650 dialysis institutions of all types. Other factors, such as unit size and area wage level, were held constant.
Absence of Competition	
The existence of dialysis institutions larger than twice the break-even size leads one to question why competitors have not entered the market	The issue needs more thorough analysis, but the preliminary indications suggest that competitive forces are not bringing more providers into the market. The most likely explanation is Certificate of Need Requirements which reduce competition.
Average cost per dialysis decreases as the dialysis unit increases in size, suggesting that costs have not been driven to a common level by competition	Amenities competition (see first point above) should theoretically push all competing facilities toward the same level of costs but is not observed to do so.

Table 5

Major Potential Benefits and Criticisms of Competitive Insurance Proposals for the ESRD Program*

Potential Benefits	Potential Criticisms
• For a Given Level of Public Financial Support a. Improved Welfare of Patients b. Patient Sovereignty Over The Program	• Competitive Rhetoric Will Be Used As a Ruse for the Political Process to Reduce Benefit Levels
• Program on Budgetary Savings Are Possible Depending on The Strategy Adopted	• Patients Can't Make Informed Choices, i.e., Patients Will Not Make Appropriate Choices of Medical Care
• Least Intrusive Government Directives to Providers and Patients	• Provider Financial Interests Will Dominate Patient Interests
• Neutral Fiscal Incentives for Providers Permit Patient Preferences and Medical Benefits to Govern Treatment	• Vouchers Are Administratively Complex and Difficult to Implement
• Removal of Potential Provider Financial Conflict of Interest	• It Will Be Politically Difficult To Allow Patients To Take Cash or Non-Medical Services As a Reward For Economizing Behavior, Particularly Since Medicaid or Private Insurance is Usually The Last Payer For ESRD Services
• Removal of Any Above-Average Profits From Both Profit and Non-Profit Institutions	
• Assurance That The Methods of Treatment Are Economically Efficient, i.e., The Most Output for a Given Level of Spending	

*These brief statements of benefits and criticisms naturally leave a substantial amount unsaid.

Research Area Two: Empirical Cost Determinations (see Table 2 for publications)

First Example Publication:
Competition and Efficiency in the End Stage Renal Disease Program

In this paper, the basic approach was an empirical approach to cost finding. The focus of this paper was:

a. In more competitive markets, as measured by the concentration of dialysis units, it is hypothesized that providers will be forced by competition to give more services to patients at the same cost to the government.

b. More services at a fixed payment rate leads to lower profits for providers, other things equal.

Table 6, reproduced from the paper, shows the evidence to support (b). The coefficient on the Herfindahl index shows that as dialysis markets get less competitive, profits increase with other covariates held constant. In other words, when competition is more intense, profits are lower and as the paper shows, there is evidence that some amenities to patients are increased.

This result is quite impressive since it demonstrates in a way that few or no other studies have shown, the potential benefits of competition in health care markets. In this case, the results show that at no increased cost to the insurer, patients can be made better off. This also means that the same services could be bought for less in competitive versus non-competitive markets.

This paper led the noted MIT economist Paul Jaskow to editorialize in the Journal of Health Economics (2:1983):

> The paper by Philip Held and Mark Pauly that appears in this issue has important implications for government reimbursement and cost containment policies affecting health care providers that go well beyond the End Stage Renal Dialysis Program. They make use of theoretical and empirical techniques that have been developed and applied by economists to analyze the effects of price regulation in industries outside of the health care sector. This has enabled them to identify an important problem in designing reimbursement and cost containment programs in the health care sector. There is no unique 'minimum cost' for providing health care services when the intensity and quality of care can vary. Defining any particular reimbursement rate simultaneously defines the quality, intensity or amenity level of the care provided. Furthermore, the relationship between the reimbursement rate and the nature of the services provided will vary depending on the extent of competition between providers in different markets.

Table 6

Pseudo-profit for dialysis institutions regressed on institution and area characteristics, U.S., 1978.[a]

Independent variables	Mean	Standard deviation	Regression coefficient	*t* statistic
A. *Institution characteristics*				
1. Type of dialysis unit (binary)				
a. Hospital dialysis center	0.36	0.48	57,484	1.80
b. Hospital dialysis facility	0.14	0.34	30,818	0.78
c. Hospital transplant center	0.16	0.36	−33,430	−0.90
2. Profit status (binary)				
a. National Medical Care, Inc.	0.10	0.31	−62,605	−1.49
b. Other for-profit	0.17	0.37	−986	−0.03
3. Physician capitation (binary)	0.47	0.50	25,314	1.32
4. Number of dialysis stations	13.37	8.22	9,155	6.91
B. *Patient characteristics*[b]				
1. Proportion of patients:				
a. Dialyzing at home	0.19	1.07	−549	−0.04
b. Partial care	0.04	0.16	104,617	1.77
c. Self-care	0.01	0.08	44,584	0.38
d. In training for home care	0.02	0.06	−75,420	−0.44
e. Non-Medicare	0.14	0.26	−41,071	−0.81
C. *Area variables*				
1. Herfindahl index	0.49	0.38	76,587	1.73
2. Population per sq. mile	1,921	5,359	−0.78	−0.38
3. Total population	2.12E+6	2.73E+6	0.02	4.38
4. Percent black	13.20	11.40	1,104	1.09
5. Urban binary	83.43	21.11	364	0.58
6. Median family income (1969)	8,789	1,785	−13.36	−1.33
D. *Input prices*				
1. House rent[c]	10.98	2.43	2561	0.35
2. Nurse salary per year ($)[d]	19,076	17,639	1.04	1.94
Constant			−38,958	−0.40
Adjusted R^2/n			0.16/651	
Joint *F* statistic			5.97	
Dependent variable (pseudo-profit)	$155,478	$252,617		

[a]Pseudo-profit is the difference between charges and all costs except physician salary. (See table A-1 for details on data sources.) *n* is sample size.
[b]As a proportion of patients dialyzing in the facility.
[c]Median rent per month 1970 times 0.1.
[d]This is the annual salary for nurses in the year of the survey in the individual dialysis unit.

Second Example Publication:
"CAPD and the Debate Over Efficacy and Cost--Some Preliminary Evidence"

In this paper, the basic approach was to select a sample of relatively homogenous new dialysis patients in 1981 and compare their known characteristics, inpatient medical care use, and one-year survival.

Shown in Table 7 (reprinted from the paper) are some basic statistics. CAPD patients had death rates comparable to in-center hemodialysis patients but dramatically higher use of inpatient care. (The statistical tests used in the paper were more sophisticated than this discussion indicates.)

Since CAPD patients are not randomly assigned to this therapy, there is a real danger in concluding that CAPD causes these higher rates of inpatient use. While we did control for the known patient covariates, there is still the chance that more severely ill patients were assigned to CAPD. In fact, on measured covariates, the CAPD population had much more diabetes, a condition known to severely complicate renal disease. It is plausible then that on unmeasured covariates, CAPD patients are more severely ill and more costly to treat regardless of therapy.

What this paper did conclude was that based on one-year survival, CAPD appeared to be as efficacious as other therapies. But the cost effectiveness compared to other therapies remained an issue. Curiously, a recent OTA report on CAPD made extensive use of this paper funded by this grant.

Table 7

Selected One-Year Statistics For New Dialysis Patients By Method of Treatment, First Quarter, 1981[a]

Selected First Year Statistics	Dialysis Type and Location			
	CAPD	Hemodialysis		Other
		Home	Facility	
Died (%)	12.6	9.2	13.6	30.5
Hospitalization:				
Hospitalized (%)	71.2	54.8	55.7	68.0
Hospital days	22.0	14.8	15.8	22.1
Hospital stays	1.7	1.3	1.2	1.9
Sample size	174	109	2,929	200

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ESRD Program Highlights, 1984 Summary Sheet. Department of Health and Human Services; Health Care Financing Administration; Bureau of Data Management and Strategy; End-Stage Renal Disease Branch.

APPENDIX A

Conclusions from:

"How Available are Evening Dialysis Services?"
by Philip J. Held and Victoria Alexander.
Published in Health Care Financing Review,
vol. 7, no. 2 (Winter 1985).

Conclusion

This article has provided some specific estimates of the availability of evening dialysis. Although we do not directly test the effect of access to evening dialysis on rehabilitation, data in the Results and Discussion sections of this article suggest that both the belief that there is a lack of availability evening dialysis and the belief that such a lack has a dramatic impact on the rehabilitation of patients should be regarded skeptically. The majority of patients are likely to have evening dialysis available in their own dialysis unit. Even greater proportions are likely to have access to evening dialysis if one examines the data from a market area perspective. Moreover, most dialysis patients live in larger urban areas, where the great proportion of dialysis units offer evening dialysis. However, changing economic conditions undoubtedly push one to be prudent in extrapolating data from 1982 to the present. More information is needed about the current state of events, yet it is unlikely that the situation has changed totally.

Rehabilitation of patients with end-stage renal disease is an ongoing issue about which we are only beginning to gain knowledge. It is important, especially in this day of budget retrenchment, that the issue be well defined and supported with hard facts, otherwise the chances of successful policy change will be greatly reduced. The evidence presented in this article suggests that evening dialysis is generally available to the great majority of patients. Consequently, even if a causal link between the availability of evening dialysis and rehabilitation is established, a policy of mandating or otherwise encouraging evening dialysis is unlikely to have a dramatic impact on patient rehabilitation.

APPENDIX B

Conclusions from:

"CAPD and the Debate over Efficacy and Cost:
Some Preliminary Evidence," by Randall R. Bovbjerg,
Louis Diamond, Philip J. Held, and Mark Pauly.
Published in Health Affairs (Summer) 1983.

Conclusions

The preliminary data reported above support the following: (1) The routine information collected by Medicare on patients with renal failure offers a potential source of useful information for policy analysis; (2) The new dialysis patients (1981) using Continuous Ambulatory Peritoneal Dialysis appeared to be "sicker" at the time of entry into therapy than patients using facility hemodialysis based on the data and criteria developed in this paper; (3) Regardless of initial diagnoses and other readily measured patient characteristics such as age, sex, race, the data reported here do not suggest a higher death rate for CAPD patients in the first year of therapy; and (4) CAPD patients, controlling for demographics and initial diagnosis appear to have a substantially higher rate of hospital usage than do hemodialysis patients.

Regarding efficacy and the cost of CAPD, the following observations regarding policy are offered:

1. It is important to have a clear definition of "costs" before any statements regarding CAPD's cost effectiveness can be made. Obviously, program or budget costs need to consider all aspects of what products and services are purchased by the government. In the case of CAPD, hospital costs are likely to be an important determinant for some time to come. But there are other program costs, too, that are not obviously counted such as pathology services or the hidden overhead items of supporting and caring for patients outside of the dialysis institution. Even beyond budget costs there are private costs that patients bear that need to be counted. For example, CAPD has the advantage of using less support time from family members than does home hemodialysis. These statements don't prescribe what the government should or should not pay for, but only that a clear definition of what costs are being discussed is needed.
2. CAPD is an emerging therapy that offers the potential of a real change in the lives of some ESRD patients. Costs are only part of the equation, however. Benefits are important too and serious policy debate cannot ignore the issue that the "product" may be different from that of alternatives.
3. While the government cannot be oblivious to the issue of costs, it would seem prudent that the government's role is to focus on how much it wants to spend on a dialysis patient. How that money is spent and what therapy is chosen is an issue best left to patients, their family, and their physicians.

APPENDIX C

Conclusions from:

Medicare's End Stage Renal Disease Program: How a More Competitive Approach Would Address Important Policy Issues, by Philip J. Held, Randall R. Bovbjerg and Mark V. Pauly. Federal Trade Commission Report, August 1983.

V. CONCLUSION

The foregoing discussion of competition and costs highlights the importance of considering both the pros and the cons of each possible pro-competitive strategy. We have attempted to illuminate both pluses and minuses in this paper, although the former may have received more attention than the latter. Our discussion is somewhat theoretical, both because data on existing

Table 15

Major Potential Benefits and Criticisms
of Competitive Insurance Proposals for the ESRD Program[a/]

Potential Benefits	Potential Criticisms
o For a given level of public financial support: a. Improved welfare of patients b. Patient sovereignty over the program o Program or budgetary savings are possible depending on the strategy adopted o Least intrusive government directives to providers and patients o Neutral fiscal incentives for providers permit patient preferences and medical benefits to govern treatment o Removal of potential provider financial conflict of interest o Removal of any above-normal profits from both profit and non-profit institutions o Assurance that the methods of treatment are economically efficient, i.e., the most output for a given level of spending	o Competitive rhetoric will be used as a ruse for the political process to reduce benefit levels o Patients can't make informed choices, i.e., patients will not make appropriate choices of medical care o Provider financial interests will dominate patient interests o Vouchers are administratively complex and difficult to implement o It will be politically difficult to allow patients to take cash or non-medical services as a reward for economizing behavior, particularly since Medicaid or private insurance is usually the last payer for ESRD services

a/ These brief statements of benefits and criticisms naturally leave a substantial amount unsaid.

competition are sketchy and because there is no generally agreed-upon pro-competitive model for ESRD as there is for health care reform generally. Table 15 below attempts to summarize the main arguments for and against the general notion of competition.

Many of the objections to the introduction of more competition in ESRD markets express doubts about the administrative feasibility of implementing such an approach and how well patients could respond to competitive incentives--both of which should be illuminated by further research and policy analysis. The main drawback is that competitive rhetoric could be used to mask outright cuts unsupported by competitive philosophy. This negative is balanced by the reality that arbitrary cuts are a danger inherent in any payment reform. On the other hand, the potential benefits of competitive measures are considerable, and there is some empirical evidence that ESRD patients' welfare has already been improved by competition among maintenance dialysis providers for patients in some markets. Movement toward pro-competitive reforms seems to us feasible and desirable. Readers must of course make their own evaluation; after all, the marketplace for ideas is a highly competitive one.

APPENDIX D

Conclusions from:

"Charging the Victim: An Evaluation of Reimbursement Policy in the U.S. End-Stage Renal Disease Program," by Philip J. Held and Mark V. Pauly, in Social Policy Evaluation, edited by E. Helpman et al. Academic Press, 1983.

Conclusion

Our evaluation of present and proposed reimbursement schemes for ESRD program beneficiaries showed that an empirical investigation of facility production functions indicated the way productivity varied with a number of characteristics of reimbursement systems and facilities, and an empirical investigation of the determinants of amenity showed that amenity did vary with competition and facility ownership. Simple economic theory can be combined with these results to evaluate the desirability of various schemes.

Although we could evaluate the potential impacts of various devices on reimbursement behavior, we are unable to move from such positive analysis to a normative prescription of an "ideal" reimbursement rate. This is because literally any fixed rate is conducive to cost minimization (at least for the predominant for-profit firms), but the level of the rate determines the level of amenity and accessibility (depending on the degree of competition and profit). Without an explicit statement about (or even definition of) the ideal level of these characteristics, it is not possible to fix a reimbursement rate. Analysis is, nevertheless, useful for pointing out that there are likely to be conflicts between regulators interested in reducing program costs and renal disease patients interested in making their lives as bearable as possible.

APPENDIX E

Conclusions from:

"Competition and Efficiency in the End-Stage Renal Disease Program," by Philip J. Held and Mark V. Pauly. Published in Journal of Health Economics, 2 (1983).

8. Conclusion

The theory discussed in this paper suggests that estimated coefficients for medical service production or cost functions are subjected to a 'competitive amenity bias' which may result in the failure to identify factors that affect economic efficiency. That is, observations on actual cost or productivity will generally not yield unbiased estimates of cost or production function parameters so that estimates of the cost of care based on those parameters will be biased by the degree of amenity competition. The most we can do is determine whether bias is present, and if it is, to estimate qualitative effects. Our investigation of productivity of dialysis facilities did indeed indicate both the likelihood of bias and some qualitative results.

If there is competitive amenity bias, what does this imply for attempts to set reimbursement levels? It implies first of all that it will be very difficult to estimate cost, even for a typical producer. It also implies that variation in the level of reimbursement will, in competitive markets, affect the level of amenity delivered to patients. *Incurred cost, amenity, and patient well-being will all vary positively with the reimbursement level.* Determining the 'right' level of reimbursement is not a (theoretically) simple matter of determining cost-plus-normal profit and setting reimbursement equal to that. Rather, ideal reimbursement requires a *policy decision on how much total amenity society wishes to deliver to beneficiaries of public programs.* While some amenities have been excluded as not reimbursable, there has yet to be a decision on the complete set of amenities.

Finally, once the level of amenity is determined, there are two possible policies. If amenity can be monitored and regulated by the public payer (which is often difficult if not impossible), then reimbursement can be varied with factors that affect cost. If, as seems likely, amenity cannot be controlled or monitored, then amenity will vary across beneficiaries and providers, depending on input costs, organizational structure, and the degree of competition. Considerably more information about amenity levels, cost, and how they vary with competition is needed in order to determine proper reimbursement levels.

While we were able to evaluate the potential impacts of various devices on reimbursement behavior, we are unable to move from such positive analysis to a normative prescription of an 'ideal' reimbursement rate. This is because literally any fixed rate is conducive to cost minimization (at least for the predominant for-profit-firms), but the level of the rate determines the level of amenity and accessibility (depending on the degree of competition and profit). Without an explicit statement about (or even definition of) the ideal level of these characteristics, it is not possible to fix a reimbursement rate. Analysis is, nevertheless, useful for pointing out that there are likely to be conflicts between regulators interested in reducing program costs and renal disease patients interested in making their lives as bearable as possible.

APPENDIX F

Abstract from:

"Pro-Competition Health Insurance Proposals and Their Implications for Medicare's End-Stage Renal Disease Program," by Randall R. Bovbjerg, Philip J. Held, and Mark V. Pauly. Published in Seminars in Nephrology, vol. 2, no. 2 (June) 1982.

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ABSTRACT

Medicare spends approximately $2 billion a year on nearly comprehensive medical care for about 60,000 Americans with End Stage Renal Disease (ESRD). The sheer size of the program, its high political visibility, and its rapid growth (exceeding some early estimates) make it a natural target for cost-cutting reforms. Indeed, change seems inevitable. This paper analyzes cost issues, patient and provider behavior, and how "pro-competitive" reforms might address issues of cost and quality, as well as the general aspects of the program as perceived by patients, providers and the government.

Current cost containment relies on two main strategies: (1)The number of dialysis stations has been limited by certificate-of-need and other regulatory provisions in an effort to limit capital costs and to discourage inappropriate utilization. (2) Prices have been limited by paying essentially the same charge for each maintenance dialysis treatment since the program began in 1973. (A third strategy, promoting allegedly cheaper home dialysis and reducing the in-facility payment level, has been proposed but not yet implemented.)

The current ESRD marketplace, particularly the market for maintenance dialysis, thus resembles commercial aviation before Civil Aeronautics Board deregulation began: Price is fixed by the government, and a limited number of providers can seek to attract customers (nephrologists and their ESRD patients) only by offering more convenient access and hours of dialysis, better facilities, more personnel, and other characteristics ancillary to the basic treatment capability. As for airlines, it appears that competition among multiple dialysis units, where it exists, has raised the level of such ancillary "amenities" given to customers. Under competition, patients thus receive more and providers less of the value of Medicare payments, so that "profits" are lower (for non-profits, excess of revenues over costs). This effect supports the argument that more competition (i.e., freer entry of new providers and expansion by old ones) would improve resource allocation by maximizing patient benefits for a given level of government payment.

Achieving overall ESRD savings (particularly for the government program) is another matter altogether. There is no magic in the various pro-competitive strategies that would automatically lower the costs of providing ESRD services. In fact, where services are so dominated by public payment, what determines "cost" is how much government is willing to pay. Lowering payment levels would save money by changing patterns of practice, patient access, and provider "earnings" (whether for-profit or non-profit). Increasing home dialysis under current practice might or might not lower overall spending and total social cost. Evidence that costs are lower at home is not convincing; in general, larger dialysis facilities are much cheaper per service than smaller ones, and the home is the smallest of all. The main "economy" seems to be low cost (or no cost) home labor.

One meaning of "competition" is greater patient choice among and equalized payment for different sites and modes of treatment that offer equivalent care or are substitutes for one another. Under such competition, home care and all other alternatives would increase or decrease according to patients' and physicians' assessments of the relative costs and benefits involved. In addition, patients and providers could maximize their satisfaction with care for a given level of government payment. But total program spending would still be established by the basic payment level, not by patients' choices (home vs. facility, etc.). In the same vein, more competition would keep providers' "profits" down to "normal" levels, thus reducing conflict-of-interest problems for providers tempted to manipulate their patients for gain.

Affecting the larger allocation of all social resources devoted to ESRD patients requires more thoroughgoing pro-competitive reforms: Either providers or patients must be able to—and motivated to—weigh the relative values of different types of care and make appropriate economizing tradeoffs among them (substituting outpatient for inpatient care, for example). This requires a more "global" payment system rather than the current fragmented methods which pay separately for dialysis services of different types, for inpatient care, etc. Some variant of paying providers global capitation for all services (including ESRD and non-ESRD, perhaps) or giving beneficiaries vouchers to buy all care would achieve this.

In either case, government must still face the politically difficult choice of how much it should contribute. Seeking competitive bids from providers and closely monitoring the resulting quality and access to care is one way to help decide whether spending is appropriate or could be lower. An alternative to this "set the rate and observe the outcome" strategy is to involve patients in the decision by allowing them to share in the cash savings achieved by economizing—through a voucher, or voucher-like, system. In any event, careful attention to both cost and quality-access incentives is important.

APPENDIX G

Conclusions from:

"Survival Analyses of Dialysis Patients," by
Philip J. Held, Mark V. Pauly, and Louis Diamond.
The Urban Institute, 3064-21, November 1985.

DISCUSSION

The influence of diabetes on mortality risk is generally well known. The results reported here confirm the higher mortality and show that relatively it decreases with age, given other patient and CDU characteristics. Blacks have somewhat lower mortality on dialysis than do other races. Larger CDUs appear to have lower mortality rates.

We suspect that at least part of the cause for patients with unknown diagnoses having higher RR is that the diagnosis reporting form is not completed for some patients who either die relatively soon after initial dialysis or have an unfavorable prognosis. We included this subset of patients in the analysis to ensure representativeness of the entire set of patients.

The results for the correlates of death and survival presented here are one of the first system-wide analyses incorporating both known attributes of dialysis patients and their Coordinating Dialysis Unit. Most if not all the known patient attributes used in the analysis of this paper are exogenous, i.e., the direction of causation is reasonably certain and simultaneous equation bias in the parameters is unlikely.

The direction of causation for results of the attributes of the CDU are, however, less clear. Patients are not randomly assigned to dialysis units, and consequently there is the possibility that the pattern of choice of dialysis unit is affected in ways which are related to the cause of death. So there is some need for caution in interpretation of the results.

Consider as a specific example the RR for both profit and not-for-profit freestanding units. The parameter estimates (Table 8) tend to show that the RR for patients whose CDU was a freestanding unit (profit or not-for-profit) was lower compared to reference patients whose CDU was a not-for-profit hospital center. If less severely ill (beyond our measures of case mix) patients are more likely to choose or be referred to such freestanding units, then the causation may run from the probability of death to the type of unit, and not vice versa. In other words, cause and effect may not be distinguishable in the world of retrospective data without random assignment. We regard the potential for such reverse or mixed causation to apply for all CDU characteristics.

Since random assignment of patients to CDUs is not an ethical or practical possibility, the type of retrospective data-fitting presented above may be one of the few alternatives for analysis of these and related issues. In any case, these results clearly indicate that something important is

different between CDU types; either patients are sorted by severity in their unit choice, or type of CDU has an effect on mortality. An alternative estimating procedure would be to employ more complicated statistical techniques which attempt to control for the self-selection or endogeneity (joint determination) of the provider covariates. As yet, though, the development of such techniques for use with models such as Cox's proportional hazard model are unknown or at least untested. Nonetheless, the results presented above are most interesting in that they at least help to define future research agendas.

The results on mortality for patients of freestanding units are interesting in another sense. The RR for patients from for-profit and the not-for-profit freestanding units are quite comparable. Patients from both classes of these freestanding units have lower mortality than the hospital reference group. This suggests that although this type of CDU as a whole (freestanding) has lower RR, the differences by ownership are not important. In other words, ownership of the unit (profit or not-for-profit) does not seem relevant when comparing RR for freestanding units even though the freestanding units as a group have lower mortality than do the hospital-based reference group.

The results on the impact of dialyzer reuse are particularly notable given the substantial controversy about reuse of dialyzers (Ogden et al., 1982; Keshaviah et al., 1980). While the results presented above are by no means conclusive, they do suggest that perhaps the long-run effects of reuse may not be detrimental to patients' health. Had the results been the opposite effect, for example, the results would have been substantially more controversial. However, again the problem of distinguishing between cause and

effect discussed above are also important here although in a different context. Patient self selection to units which reuse dialyzers or CDU selection of patients with inevitably better health is less likely to be the case. In other words, it seems less plausible although not impossible than in the other discussions above that patients were selectively chosen for reuse units because of their better health status which would be the real cause of the lower mortality. However, it could also be that CDUs, which were long-term reusers of dialyzers, were really more effective dialysis units in terms of other unmeasured characteristics.

For example, suppose that dialysis units, which were long-term reusers of artificial kidneys were also the units which had more effective quality control in all aspects of the quality of care. And assume further that the real cause of lower mortality was this characteristic that was not only unmeasured but was also not correlated with any of the other included covariates. If this were indeed the case, then the lower mortality suggested for long-term reuse of dialyzers may be overstated.

What can be said about all of these results? Have we been too cautious in the interpretation and is this exercise worth the trouble? We think so, because most of the issues raised have not been thoroughly researched before. If nothing else, these results show that for effective research in this area, in both the case of patient characteristics and CDU characteristics, there is a need for more detailed understanding of the process and the necessary support data.

Consider first the case of patient measures. While we have employed extensive data which is usually associated with mortality, there are still some holes. While age, race, and sex are easy to measure and are useful

predictors of mortality, the case for shortcomings in diagnostic data is easier to make. With the exception of diabetes, most other diagnostic groupings were not particularly useful in predicting mortality. One suspects that at least part of the reason is that there is substantial unmeasured severity within these cells. Consequently, more precise severity measures will have to wait for better specification and data collection. While these HCFA data are in many ways the best and only wide-scale data available, they are not perfect and more work including design issues is needed in this area.

APPENDIX H

Conclusions from:

"Patient Severity Measures and Their Impact
on Medicare Costs in the ESRD Program,"
by Philip J. Held and Mark V. Pauly.
The Urban Institute, 3064-07, January 1985.

VII. CONCLUSION

The determinants of total and inpatient reimbursements in the ESRD program included most of the expected influences. Patient age, kidney transplantation, and type of dialysis treatment were all related to total payments. There were some surprises: the physician reimbursement method and physician

financial incentives within the group were strongly related to total costs, as was group size and facility ownership. Even more surprising perhaps was the finding that groups which most rewarded physician productivity and governmentally owned facilities have higher costs, other things equal.

Another important aspect of this study was the ability to use some measures of disease severity (as well as other case-mix proxies) directly in the analysis. Not only were these measures related to costs, but including them as controls reveals some other influences. Young people were shown to be more expensive to treat, given disease severity. Perhaps most striking of all, controlling for disease severity resulted in a measure of reimbursement savings from home dialysis which was less than 2 percent of average annual costs per patient. This result was most likely not due to measurement error or other peculiarities of the data, and is consistent with (although lower than) other recent findings suggesting low savings in total payments for patients who dialyze at home.

These results could be used to indicate which kinds of dialysis units will be winners and losers given the current prospective composite rate, or which ones will need to change their costs and the amenities they offer patients in order to maintain financial viability. They could also be used to build severity adjustments into payment rates for ESRD patients.

APPENDIX I

Conclusions from:

"How to Measure Case-Mix Differences,"
by Philip J. Held and Mark V. Pauly.
The Urban Institute, 3064-16, November 1984.

DISCUSSION

The evidence in Tables 2 and 3, and Figures 3 and 4, suggests that the division of patients among dialysis units is not related in any substantial fashion to ownership or type of facility. This does not mean that there are no differences or even in the parlance of some medical journals "sig" differences. There are statistically significant differences in severity proxies across types of units but these differences are:

- Generally not large quantitatively. For example, in 1977 our previously mentioned cost proxy (diabetes) had a difference in the means between the FPFS and hospital units of only 0.8 percentage points.

Table 3. Distribution of Selected Patient Characteristics by Type of Dialysis Unit, Michigan vs. the United States, 1977 and 1981.*

Held-Pauly Indicators of ESRD Case-Mix	Year of Observation	Type of Dialysis Unit: For-Profit Free Standing Units		Not-for-Profit Hospital Units		Ratio of FPFS to Hospital Units	
		Michigan† (1)	U.S. ‡ (2)	Michigan † (3)	U.S. ‡ (4)	Michigan (1)/(3)	U.S. (2)/(4)
Diagnostic Measures (Proportions)							
1. Hypertension with High Risk Complicating Condition**	1977	0.158	0.082	0.060	0.063	2.633	1.300
	1981	0.116	0.107	0.088	0.088	1.318	1.216
2. Collagen, Glomerulonephritis, or Polycystic Kidney with High Risk Complicating Condition**	1977	0.158	0.172	0.200	0.187	0.790	0.919
	1981	0.185	0.143	0.164	0.159	1.128	0.899
3. Low Risk Conditions	1977	0.399	0.500	0.541	0.531	0.738	0.942
	1981	0.387	0.438	0.488	0.482	0.793	0.910
General Measures							
Mean No. of Months Since Renal Failure	1977	21.452	24.477	24.345	23.287	0.881	1.051
	1981	29.678	31.201	29.832	30.309	0.995	1.029
Sample Size							
Dialysis Units	1977	2	195	29	536		
	1981	5	338	31	530		
Average Number of Patients Per Unit	1977	46.7	42.4	27.1	23.0		
	1981	66.7	50.3	41.9	33.9		

*Patients were "assigned" to the unit which provided the mode (most) number of dialysis treatments for the year unless the patient had a transplant that year, in which case the patient was assigned to the transplant center. Unit of analysis is an individual patient.

† Less Upper Peninsula.

‡ Less Michigan.

**High Risk Complicating Conditions were defined as one or more of the following secondary conditions: heart disease, uncontrolled hypertension, diabetes, or pulmonary disease.

- Quite small compared to the differences within type. For example, for diabetes the coefficient of variation within a type group is approximately 60 to 100 percent.[6] Consider the data of Figure 5 which shows the distribution in the U.S. of both FPFS and hospital units in the proportion of patients who are diabetic. Clearly, the variances are large and similar for both groups. Furthermore, as shown in Appendix II, these measures of variation within cells apply to all other severity measures we have developed on a national basis.
- By no means fixed over time. For example, based on our national data, the mean months since renal failure had a difference between types of units of approximately 12 percent in 1977. By 1981, this difference had narrowed to 2 percent.[6]

In summary, while there are substantial differences in severity proxies from dialysis unit to dialysis unit, differences between types or ownership of units are not likely to be especially important in explaining those differences.

What are appropriate reimbursement conclusions regarding variations in case-mix across units? To draw any implications at all, one first needs the missing pieces of the puzzle: what are the relationships (if any) between various measures of severity and marginal or average cost? We have recently completed a study of the statistical relationship between case-mix, other facility and patient characteristics, and cost.[5] Our results suggest that some patient characteristics not incorporated into the measure used in the Michigan

Study, such as number of months since renal failure, may also be important. It is not even obvious that variables which are useful in predicting survival probability are going to be good predictors of cost, since most of the cost which accompanies death for ESRD patients occurs in hospitals, not in outpatient dialysis facilities. For example our current work has shown that at least two thirds of a $5,000 difference per year in Medicare expenditures between a reference group of low-risk patients and patients with diabetes occurs in the hospital for inpatient care.[5] For patients with hypertension, most of the difference occurs in physician payment and not as inpatient care.

Nevertheless, it is quite likely that

(a) measures of case-mix will help to explain cross-facility cost variation, and

(b) there will still be considerable unexplained variation, even if we do as good a job as we can.

If this turns out to be the case, there are, we think, two important consequences for payment policy. First, and most obviously, payment should be adjusted for case-mix variation, with the size of the adjustment indicated by the empirically observable relationship between case-mix and cost. This policy would make the question of a relationship between case-mix and ownership or dialysis unit type irrelevant, since the cost differences would already be taken into account.

Second, it will still probably be the case that there will be variations in severity which payment mechanisms will not be able to take into account, with consequent windfall gains and losses, and possible adverse incentives if facilities can identify high cost patients whose conditions are not reflected in the payment rates. Under such a case, there will be strong incentives for providers not to accept for care the expected high cost patients.

However, case-mix is not likely to be the only "other factor" affecting the residual variation in cost. Variations in input prices or quality of inputs (not incorporated into wage indexes), the history of a dialysis unit, and even unit size, are also likely to be related to cost. The most that can be done is to reduce the variation down to a tolerable level. As long as patients continue to be accepted for treatment, it is unlikely that more can be done.

APPENDIX J

Conclusions from:

"Developing a Workable Case-Mix Index That Relates to Cost:
Experience for Patients with Chronic Renal Failure,"
by Louis Diamond, Philip J. Held, and Mary Jo Palumbo.
The Urban Institute, 3064-11, July 1984.

V. CONCLUSIONS AND OBSERVATIONS

The primary purpose of this paper was to develop a framework to measure case mix differences for dialysis patients in the ESRD program. The framework developed was based primarily on nephrologists' judgments about the likely impact of patient characteristics on costs although separate work has shown that the proposed framework produces empirical estimates generally consistent with the a priori judgments.

The proposed framework combines diagnostic data, especially the presence of diabetes and hypertension, with other patient indicators such as age, sex, race, and length of time since renal failure.

Detached analyses of the statistical composition of these measures including differences over time and across type of dialysis unit were performed. In brief:

- There are some patterns revealed by the data that are generally consistent with the epidemiology of the disease. For example, non-whites and the middle age group of patients tend to be associated with hypertension. The young are more likely to have non-complicated risk conditions and remain on dialysis for a relatively longer time. The older patients have more complicating conditions and remain on dialysis for a relatively shorter period of time.
- Over time, there was a definite shift towards more complicated patients, suggesting a lower criteria in

accepting patients for dialysis or, in other words, an increasing tendency to accept the more severe patient cases for renal dialysis. In particular, the proportion of diabetics was increasing. While there is a general shift in the age distribution towards an older population, this trend masks the fact that the number of younger patients was also increasing in the 1977-1981 period.

- Comparisons of case mix across type of dialysis unit were generally notable in that, with a few exceptions, the variance was not great. In fact, the variance of case mix across dialysis units within a given type was almost as great as that across cells. The general exceptions include the younger and less risk prone populations of the transplant centers. Free-standing for-profit units had higher proportions of non-white patients. On a diagnostic basis, however, the differences across non-transplant dialysis units were remarkably small.
- Over time, differences in case mix across type of unit may be tending to diminish.
- The comparison of differences in case mix across dialysis units indicates that these several patient measures (age, race, sex . . .) are independent of one another, i.e., these multidimensions cannot readily be reduced to a fewer number of dimensions. In other words, the variance in case mix across dialysis units is not readily

captured by one or two measures. (See the "principle component" analysis in Appendix 1.)

Implications

What do all these numbers mean? This analysis and the related work suggest that the examination of case mix differences and their effects on costs is, in fact, a viable endeavor. There do appear to be patterns which are consistent with practitioner judgments and which are borne out by more quantifiable cost-finding techniques.

This proposal for measuring case mix differences does offer a basis for shaping reimbursement policy in such a manner in which differences in reimbursements could be tailored to differences in expected costs for individual patients. This proposal for severity indicators in the ESRD program would enhance the ability of the government to design a prospective payment system which would equalize access to care for all patients at a lower program cost than could be achieved under a flat-rate prospective system. This proposal has the following notable attributes:

- The measures of case mix are relatively few in number.
- The measures proposed are generally difficult to tamper with in that these measures can be audited and are not subject to substantial provider discretion. One might mention, however, that a future indexing system would necessarily include more precise definitions of such case mix measures to insure that these patient groups will not be subject to discrepancies in interpretation.
- The measures can be determined in advance of treatment.

One issue of continuing controversy deserves mention. The issue is whether one class of provider offering the same services should be reimbursed at a greater rate because of membership in that particular class. The answer, under generally accepted criteria of economic efficiency, is no. It may be propounded that these services are not the same among classes of providers because of differences in patient mix complexity. The criteria proposed above and the subsequent statistical analysis suggest that the variance within cells (the differences in patient complexity within a particular class of dialysis provider) is likely to be greater than the variance across cells (among the various types of providers). Consequently, it would seem that a policy of reimbursing for individual patients would be preferred over a policy based on membership in a class on the grounds of economic efficiency.

While we think this proposal is reasonable and modest, we would like to acknowledge the following limitations:

- The measure of diagnostic case mix severity, which we have used, is based on data at the time of a patient's renal failure. It is conceivable that individual patient severity could change over the course of treatment in a non-uniform manner so that case mix severity at a point some time after renal failure is not necesarily measured by diagnostic information at the initial stage of renal failure. We have attempted to control for this by the measure of months since renal failure, but not all diagnoses might "age" at the same rate.
- The data on which this analysis is based are subject to potential non-response error in that the diagnostic data at time of renal failure are not available for all

patients. While we generally believe that any non-response bias from this source is likely to be small, we are continuing the analysis of this issue. We also might point out that any bias which might exist in the data would pose a problem only if it was found to be systematically related to one of the patient measures. It also bears notice that other measures of case mix such as age, sex, race, and months since renal failure have a trivial amount of non-reporting.

APPENDIX K

Introduction from:

"A User's Insight into the ESRD Systems Files,"
by Victoria D. Alexander and Philip J. Held.
The Urban Institute, 3064-13, August 1984.

I. INTRODUCTION

Medicare's End Stage Renal Disease (ESRD) program reportedly cost 2 billion dollars in 1984, and the budget is still growing. The ESRD program is the subject of much inquiry and fascination for this and many other reasons. A unique feature of the ESRD program is the extensive record of the program that exists in the numerous files that have been accumulated over the years. Many of these files go back as far as the beginning of the program in 1973. This data system is a valuable research tool; its intricacy allows detailed study of the ESRD program, once the researcher becomes familiar with the complexities of the system.

One basic input to the data system is the Medicare medical claims records, the millions of records that chronicle the payment for all medical treatment, renal and non-renal, of patients with chronic renal failure. These medical claims constitute a unique and rich longitudinal record, by patient, of all the various services that patients have received. Records can be distinguished in great detail including type of service (physician, medical, hospital), place of service (inpatient, outpatient), provider, and date, among others. In addition, a medical history form which provides substantial information on patients at time of renal failure is available for many ESRD patients.

Another focus of the renal information system is data available on a provider-specific basis. Two principle sources of these data are the Facility Surveys and the outpatient maintenance dialysis "Cost" forms ("Renal Disease Facility Cost and Statistical Questionnaire" or "Hospital, Skilled Nursing Facility and Health Care Complex Statistical Data" or "Renal Dialysis Facility Statistical Data").

We have been working with most of these data files for some time under various HCFA grants. File construction and preparation has consumed substan-

tial resources and required years to complete. Our efforts have required extensive consultation with HCFA personnel, including Michael McMullin, Paul Eggars, Rose Connerton, Julius Hodges, and Earl Swartz. We have also studied numerous file guides. In the process we have acquired experience and insight that we would like to record in this document so that other researchers will find the path a little easier. Undoubtedly, there are numerous sources at HCFA that we have not tapped and there is surely some information that we failed to obtain. However, we believe that the information we have gathered will be useful to those who follow.

The files which will be discussed in this paper are: the archival and the annualized formats of the Reimbursement and Utilization System (RUS), the Medical Information System (MIS), Cost files, Facility Survey files, and the "Eggars' Aggregation."

APPENDIX L

Conclusions from:

"An Economic Analysis of the Production and Cost of Renal Dialysis Treatment," by Philip Held and Mark Pauly. The Urban Institute, 3064-03, June 1980, (rev.) August 1982.

VI. CONCLUSIONS AND IMPLICATIONS FOR POLICY

The previous section has presented technical econometric results along with an interpretation in a narrow, highly specialized sense. In this section, we attempt to generalize and extend these technical conclusions to issues of policy. The format will be to present and discuss a series of questions or statements that seem to be relevant to the current policy debates, bringing to bear, in a non-technical format, the analytical results of the previous sections. The order of topics is random.

1. Profit Versus Not For Profit Dialysis Facilities. A major issue of current interest is whether the government should adopt policies which discourage for-profit dialysis firms. The general reasoning offered for such policies is that the for-profit firms in the pursuit of monetary gain, provide less services or services of a lower quality to patients, than do the not-for-profit providers. The analyses provided in this paper which focused on the free standing non-hospital dialysis facility, would not be consistent with such a policy. The results of both the cost and production functions suggest that the differences between for-profit and not-for-profit firms in both costs and efficiency are reasonably small. There is little or no evidence that the real resource inputs per patient (nurses, dialysis machines, etc.) used by the for-profit firms is any less than that used by the not-for-profit firms.

There is an added advantage of having for-profit firms in the industry which should be mentioned. The existence of for-profit firms with competition for patients provide one mechanism by which the true costs of treatment can be known. In fact, the lack of major difference between the for-profit and not-for-profit firms is consistent with the competitive model which suggests that where there is competition, all firms will be forced to behave in similar fashion.

2. The Potential Cost Savings of Home Dialysis. A popular, but unproven belief, is that home-dialysis costs less than dialysis provided in a facility. The analyses of this paper cannot resolve this issue, but the results presented above provide evidence that there are reasonably large and previously unmeasured costs induced by home patients on the facility which provides the home patient with support services. The 90 percent confidence estimates (1977-78) are $1,683 to $6,953 per patient year. The mean estimate of these costs, $4,023 per patient year, exceeds the "common wisdom" of what these support services cost facilities and, given some reservations about the data, prudence would dictate some caution about use of these estimates.[37] Nonetheless, these results are currently the best estimates available and a fair interpretation of these results would be to focus on the 90 percent confidence estimates with the qualitative conclusion that the cost of support functions for home patients is likely to be higher than the "common wisdom".

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[37]An initial draft of this paper prompted comments from reviewers which questioned the magnitude of the estimated cost of support services for home patients, specifically that the mean cost estimate of approximately $4,000 was too high. A discussion of this issue is contained in Appendix A.

Although HCFA will need more complete information to estimate the full social[38] and program costs of home dialysis, these estimates of support costs will be useful when more complete data on costs for home dialysis occuring outside the facility become available. In any case, it is clear that ESRD policy for reimbursing home dialysis needs to consider the induced costs on the facility. Recently, the procedures for reimbursing home dialysis support costs have been revised to allow facilities to bill for reasonable charges. However, since the inception of the ESRD program in 1973, these induced support costs were generally not reimbursed by HCFA and it is clear in retrospect that these induced costs represented a financial disincentive for home dialysis. Regardless of whether home dialysis is more or less costly than center-based dialysis, knowledge of the disincentives in the current program structure are useful in anticipating future program alternatives. For example, even if home dialysis does not reduce program costs on average it may still be a very good option for some patients. Without recognition of the need for HCFA to reimburse induced support costs, the program will remain with strong disincentives for home dialysis which for some patients may be a much preferred alternative.

The second finding of this study which relates to the potential savings of home dialysis relates to the nature of the falling cost curve. Since the cost of dialysis provided in a center depends on the size of the facility, a comparison of the cost of home versus center dialysis needs to specify what size center is to be used as the norm. It is not sufficient to just refer to

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[38]The average cost curve, as estimated by (16) above, can be solved for the average cost per treatment of a facility which does 156 treatments per year or approximately the number of treatments for one patient. This estimate is $197 which provides one estimate of the full social cost of very decentralized dialysis treatments.

the cost of center-based dialysis since there are many possible cost estimates which depend on the size of the facility.

3. Compensation of Physicians Under a Capitation Plan. There are two methods for compensation of physicians under the ESRD program. The two systems, which require all physicians at a facility to be compensated in the same manner, are the fee-for-service system (the initial method) and a capitation plan which is usually called the alternate method. The capitation method of compensation has come under criticism from time to time and the question is whether the capitation policy should be continued in its present form.

The analyses presented above have shown evidence for large apparent gains in productivity for physicians compensated under the capitation method. We cannot explain the precise source of this apparent difference in producivity, but have two possible hypotheses. The implications for policy depend on which explanation (hypothesis) is correct. The hypotheses and their policy impact are:

1. A sorting of patients occurs such that the treatments provided in the capitation facilities are more likely to be going to patients who are less difficult to treat than patients in fee-for-service facilities. Under this hypothesis, there is no real difference in productivity between facilities on the two methods of physician compensation, but the treatments to less complicated patients generates apparent productivity gains for capitation facilities. There are at least two manners in which this sorting of patients can occur:
   a. Less difficult to treat patients either by a random or purposive process are sorted toward

capitation centers. If the process is random (e.g., a particular income, and educational characteristics may be associated with certain neighborhoods), then physicians may be rational in opting for the capitation method. By rational, we mean that their economic well-being is improved by choosing the capitation method over the fee-for-service method. If the source of the sorting of patients is purposive, it suggests that patients and/or physicians are being sorted into groups with the less difficult patients more likely being treated in a capitation facility. In both the random and purposive cases, it would appear that the capitation option leads to greater costs for physician services than would the fee-for-service plan, i.e., the capitation option leads to higher program costs for physician services. If the capitation method does not affect the actual amounts of services rendered, total costs will be unequivocally higher. However, as will be discussed in the next section and in an earlier paper, it is possible that capitation will offer incentives to lower non-physician costs and so may reduce total costs. The relevant issue for policy is whether or not the capitation plan leads to

higher or lower total program costs.[39] It may be the case, for example, that the capitation plan leads to lower total program costs even though the capitation plan also leads to greater costs for physician services.

b. Under the capitation system, a physician can switch to the fee-for-service method of compensation if a patient is admitted as an inpatient. If this quirk in the compensation rules leads to a differential rate of hospital admissions between facilities on the two methods of compensation such that the patients who dialyze at the capitation centers are less difficult to treat, the dialysis treatments provided to these patients will be less costly. That is, if patients at the capitation facilities tend to be less difficult to treat because a higher proportion of the complex patients have been hospitalized, then the dialysis cost for capitation patients will be less, not because of productivity gains but because the average patient dialyzed is not comparable to average patient in the fee for service facility. The policy implications again, depend on the impact of the capitation

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[39] See Held and Pauly, March 1979, op. cit., for a more thorough development of this issue.

method on total program costs. If the added hospitalization leads to higher total program costs, which seems quite likely, then the capitation option should be amended to remove the incentive to hospitalize. We hasten to add, however, that whether the incentives lead to greater hospitalizations and costs is an empirical matter about which we still do not have any information.

2. The second possible explanation (hypothesis) for the apparent productivity gains for the capitation facilities is that the financial incentives inherent in the capitation method encourages physicians to minimize the amount of medical care provided. This is, of course, the current appeal to policymakers of Health Maintenance Organizations (HMOs), i.e., it provides incentives to produce less care and save on program costs. In the case at hand, it may be that the capitation method leads physicians to provide less care themselves to ESRD patients and possibly reduce the level or intensity of services provided by others at a facility.[40] If this is the case, the capitation method would lead to the observed productivity gains in dialysis treatments. What would this explanation mean for policy? The answer

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[40]We are assuming that there is no physician inducement for medical services. If there is inducement, then the capitation method could lead to a reduction of socially wasteful uses of resources.

depends, as in the general case of reduced medical care under capitation methods, on what services are reduced and on the competition facing providers.

A capitation method of physician compensation provides financial incentives for physicians to reduce the level of their own efforts and possibly to reduce the level of complementary services provided by others. The financial incentive, however, is not discriminatory and it can reduce services which are of high social value compared to their cost as well as services of low value.[41] If services which cost more than their social value are reduced, then the benefits of capitation may be beneficial. If services of high social value compared to their costs are reduced, then the consequences of the financial incentives inherent in the capitation method are likely to be socially harmful.

The defenders of (HMOs), who are confronted with these charges regarding the incentives of these organizations, usually reply that HMOs will be "honest" only if there is competition among HMOs. That is, as long as patients have an option to take their demands elsewhere, the HMO will act in the best interest of the patient. Similar arguments can be made for dialysis facilities. If there is competition for patients, then

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[41]We use the term social value in a guarded sense. Since patients usually pay only a small part of the cost, the value of most services will exceed the cost as they perceive it. The relevant criteria, then, of social value depends on how society as a whole would value patients receiving these services.

facilities on the capitation method will not be able to provide the patient with a lower level of well-being than the patient might obtain at a fee-for-service facility. If all facilities in an area are on the capitation method, and there are unfulfilled patient demands because of the financial incentives of the capitation method, then the facility which switches to fee-for-service will be able to attract all the patients, i.e., competition for patients is likely to remain an important protection for the patient.

In summary, capitation facilities appear to be more technically productive that the fee-for-service facilities. This finding may not reflect real productivity differences but may be a consequence of patients in capitation facilities being less difficult to treat than patients in FFS facilities. Whether this explanation (hypothesis) implies any policy action, depends on whether the total program costs under the capitation methods are less or greater than under the FFS method. An alternative explanation for the apparent productivity gains of the capitation method is the possibility of reduced level and or intensity of services being provided under the capitation method. The policy implications of this explanation depend on the social value of the services reduced under the capitation method, although the existence of competition for patients would greatly reduce the likely need for any policy change.

In conclusion, we point to several areas in need of empirical research, since the implications for policy depend on which explanations might explain the observed productivity differential. In any case, a case can be made for altering the option in the capitation method which permits a physician to

switch to fee-for-service compensation when a patient is hospitalized. The option might be wholly eliminated or the fee-for-service payments might at least be lowered to physicians who chose capitation.

4. Regulation and the Efficiency of Input Choices. A substantial portion of the health care system is reimbursed on a cost basis. In an effort to control program costs, the extent of Certificate of Need (CON), a process whereby captial expenditures require approval by local health planning authorities, has been expanded. Current regulations require CON approval for the number of dialysis stations which a facility can use for treating their Medicare patients. However, since most dialysis facilities are reimbursed on a charge basis, the application of CON is likely to be poor social policy. Under the charge reimbursement system, the facilities have the correct incentives to choose that mix of inputs (captial and labor) which will most efficiently produce the desired output. The CON legislation probably conteracts these incentives. The analysis of the previous chapters has shown, with a reasonable degree of confidence, that the average dialysis facility, probably uses too few dialysis stations and it is likely that CON limits are the source of this inefficiency. The production of dialysis treatments with too few stations relative to the amount of labor involves true social loss in the sense that the output could be produced at lower social costs. Who bears this social loss is not entirely clear and depends on, among other things, the amount of competition in the market for patients. If there is competition (and certainly there is in some markets, if not all), then it is reasonable to believe that at least some of the cost is borne by patients, i.e., with more efficient production in competitive markets, patients would receive higher amenity levels. Patients probably also suffer in other ways because of the CON requirements that the dialysis stations be used at what are

inappropriately believed to be socially efficient levels of use. Requiring a high level of station use probably reduces the flexibility of the dialysis facility in terms of being able to schedule more closely to patient preferences. It is like requiring the airlines to have a high load factor but not permitting or requiring them to lower fares. It becomes more difficult for passengers to obtain the flights of their preference when the load factors are quite high.

The cost minimizing mix of inputs depends on the production technology and the input prices. Input prices, especially labor costs, probably vary from locality to locality. Under the charge based system of reimbursement for dialysis treatments, the financial incentives to for-profit dialysis facilities are to use the optimum mix. The arbitrary standards applied by CON which specify a minimum number of treatments per week, are likely to be totally devoid of any concern for input prices, and are consequently not likely to lead to productive policy. Serious consideration should be given to removing CON requirements regarding the number of dialysis stations a facility can use.

One should mention that if facilities are allowed to switch to a cost based reimbursement by successfully obtaining a waiver to the national price screen, then the incentive structure changes. Under such circumstances, CON may make more sense, but in implementing CON in such cases, more consideration should be given to the issue of the cost minimizing mix of inputs as determined by technology and input prices.

5. Convenience for Patients and Program Cost. The declining cost curve (See Figure V-1) indicates that as the number of treatments per time period increases, cost per treatment declines. However, as the number of treatments per time period increase, i.e., as facilities grow in size, it necessarily

implies that patients will have to be drawn from further and further distances and thus experience greater and greater indirect costs. Determining the optimum mix of patient travel cost and dialysis cost is a major research effort in itself, but it should be recognized that cost savings achieved by having larger facilities compared to several smaller facilities imply indirect costs to patients who must travel greater distances to receive treatment. This issue will be developed in greater detail below.

6. Competition Among Facilities. Many beneficial things can be said about the charge based reimbursement system used in compensating a large proportion of dialysis providers.[42] However, many of these beneficial factors also depend on an assumption of competition in the industry. Currently, we don't have an accurate and total assessment of the competition in this industry. Anecdotal evidence suggests that it varies across markets with competition being quite strong in some and nonexistent in others. What can the previous analysis tell us about competition in the market for dialysis patients?

In previous work,[43] we showed that if there is competition for patients, there will be no rents, or profits, the economist's term for unearned or excess profits. When dialysis facilities compete for patients, the result will be that patients receive the full value of Medicare's reimbursement in the form of amenities accompanying the basic dialysis treatment. The only profit remaining will be that which is "earned" or a return to invested capital sufficient to keep the captial in the industry. While this powerful conclusion is based on theoretical considerations, it does depend on an assumption of competition for patients. In the following discussion, we would

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[42] See Held and Pauly, November 26, 1979, op. cit.

[43] Ibid.

like to reverse the argument and ask if there is evidence of rents or unearned profits in this industry.

Figure VI-1 repeats the average cost curve previously presented in Figure V-1. Since this figure depicts the pure effect of size on costs, i.e., other mitigating factors such as wage rates and the cost of physicial buildings are held constant, we may not observe declining average costs in the real world. For example, a large facility may have falling costs because of size, but equally offsetting rising costs because of wage rates. But if one did observe actual average costs which fall with size, this could be considered indirect evidence that rents were being made. We have added to Figure VI-1, the mean of reported average costs for dialysis treatments for 12 size categories of dialysis facilities.[44] (These data are presented in Table VI-1.) Overall, there is an amazing correspondence between the curve depicting the pure size effect and the actual reported average costs. The percentage plotted next to each reported mean value is the cumulative percent of the sample that is equal to, or less than in size to, that interval. Therefore, the 87 percent by the sixth plotted point, indicates that 87 percent of the sample follows the estimated average cost curve quite closely. The vertical difference between the $150 price line and the actual average costs is the difference between average revenues and average costs.[45] While we are reluctant to call this rent since it also includes the return on invested captial, it is clear that firms with

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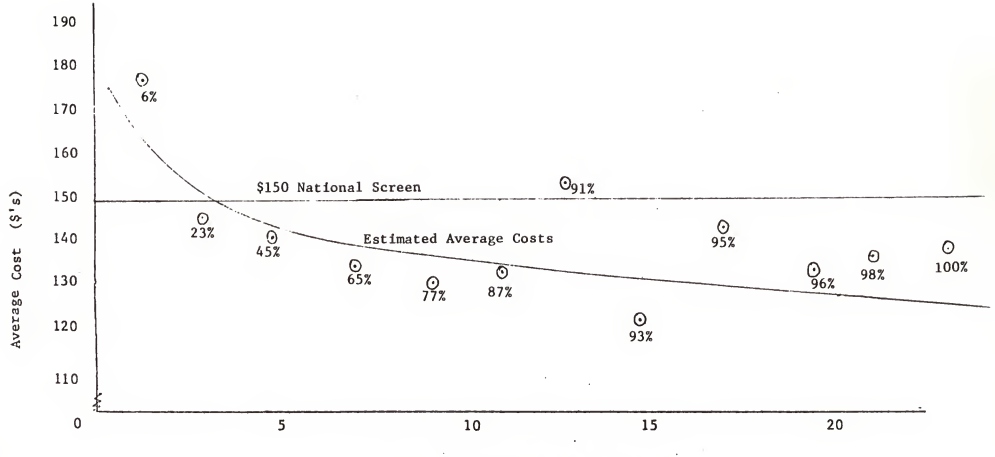
[44]Reported average cost is the ratio of the facilities reported total cost to the reported total number of dialysis treatments. These data are from the Cost Survey.

[45]This statement is only approximately true because the actual reimbursement rate can vary about 15% because the facility has a waiver to the screen and/or the facility is on the capitation method and does or does not have a laboratory.

Figure VI-1

Reported Average Cost By Size Interval And Estimated Average Cost For 1977-1978



Note: ⊙ indicates mean reported average costs for that size interval. Number beside the plotted point is the cumulative percent of the sample to the left i.e., equal to or smaller in size than that interval.

Table VI-1

Selected Statistics For Free Standing Dialysis Facilities, 1977-78[a]

Size Category	Mean Number of Treatments (000's)	Number of Facilities			Reported Average Cost per Treatment[b]
		n	(%)	Cumulative (%)	
1	1.42	11	5.5	6	$179
3	2.90	34	17.1	23	146
5	4.97	45	22.6	45	141
7	7.00	40	20.1	65	135
9	9.04	24	12.1	77	130
11	10.99	19	9.5	87	133
13	12.82	8	4.0	91	154
15	14.66	4	2.0	93	121
17	17.06	3	1.5	95	144
19	19.47	3	1.5	96	133
21	21.18	4	2.0	98	136
23	23.00	4	2.0	100	138
Total	7.95	199	100.0	100	140

[a]Data are restricted to the facilities used to estimate the cost function reported in Table V-4 above. All data are from the 1978 Cost Survey.

[b]For facilities on the capitation method of physician compensation, $12 per treatment was added to the cost reported by the facility as an estimate of physician supervisory cost. See footnote 33 for additional discussion of this point.

large facilities have greater differences than small firms. Therefore, as facility size increases it is more likely that rents or excess profits occur. One explanation for these rents is the notion that there may not be competition for patients in some markets, otherwise, all providers would have the same differential between average revenue (reimbursement level) and average cost. Furthermore, a lack of competition would also explain why the large providers are so large. While the estimate of the break-even facility size (See Figure V-1) is not exact, it is most likely to be substantially less than the number of treatments provided by some of the large facilities. Competition is likely to lead to more smaller facilities since a new competive facility is likely to enter the market whenever a single provider's size is twice the break-even point.[46]

The data on the number of providers by size category, shown in Table VI-1, show a general bulge around 5 to 9,000 treatments per year, and a reasonable distribution of facilities with more than 10,000 treatments per year. While more research is needed in this area, these data are suggestive of less than fully competitive markets in this industry.

How can we explain the absence of competition? One explanation is likely to be government regulation. Competition can be reduced by government regulation, as in the case of Certificate of Need. By restraining freedom of entry into the industry with CON, and the like, the government assures the status quo by excluding new providers, i.e., the governmental regulations may, in effect, be protecting monopoly positions of existing firms. While it is

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[46]The following section develops the notion of an optimum facility size. But it should be noted here that the facility size which results under competition is likely to vary from city to city and will depend on the density of the population, i.e., in some cities larger facilities are likely to result and will be socially desirable.

possible to have competition without freedom of entry into the industry i.e., allowing new firms to enter without the approval of health planning agencies, competition is certainly more assured if entry by new firms is relatively easy. Government regulations can reduce competition in other ways too. For example, patient choice can be affected by Network authorities who assign patients to a particular facility. In such cases, there is likely to be substantially reduced competition among facilities. The benefits of charge reimbursement in this industry will only be realized when there is competition for patients. While competition under the charge reimbursement system which pays $150 per treatment would not lower program costs, at least patients would be receiving any rents and not the owners of dialysis facilities.

How much rent is there? An upper bound estimate can be obtained by summing the difference between the facilities reimbursement charge and the predicted cost across the number of treatments and the number of facilities. This amounts to approximately 20 million dollars, or $11 per treatment. However, this "upper bound" estimate includes the normal return to invested capital, bad debts, as well as rents. The data currently available do not permit a more precise estimate of those elements of the return to dialysis facilities.[47] While $20 million is not a trivial amount of money, it is small in terms of total ESRD program costs. Reallocation of rents by other means will be discussed in the next section.

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[47]The upper bound estimate of rent assumed reimbursement of rates of $150 and $138 for fee-for-service and capitation facilities respectively. The predicted costs were based on the cost function estimates reported in Table V-4 and employ the full vector of facility characteristics. The primary missing data for more precise estimates of the categories of return are bad debts and the amount of owner equity in dialysis facilities.

7. Falling Cost and Reimbursement Policy

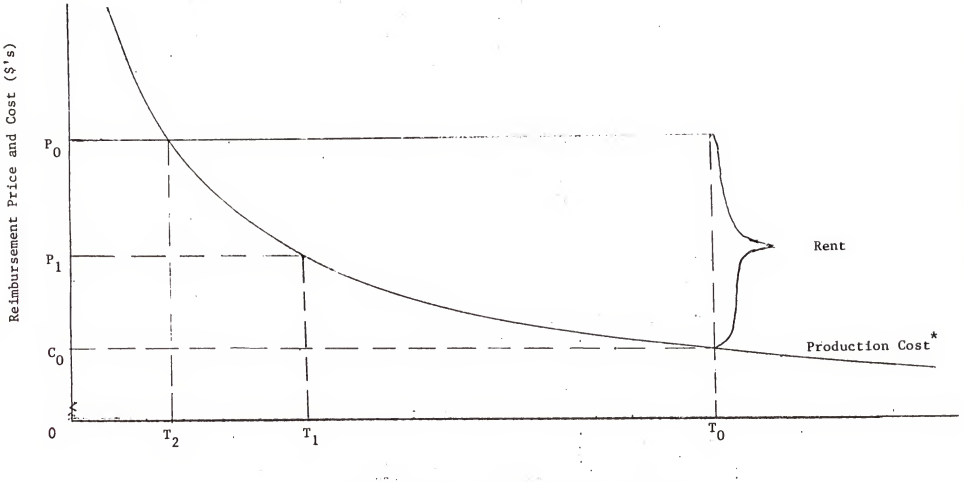
One of the most significant technical findings from the previous analyses was the falling cost curve which resulted from the technical returns to scale. But what does this technological fact tell us about reimbursement policy? Figure VI-2 shows a falling average cost curve for dialysis treatments with a reimbursement price of P_0. Suppose for discussion purposes that the cost curve includes normal return on invested capital.

If entry is restricted under this scheme, as may be done by CON, providers could be of size, such as T_0, and collect rents equal to $(P_0 - C_0)T_0$. If entry were unrestricted and competition were possible, all firms would tend to the smaller size T_2. Entry would eliminate rents or abnormal profits (i.e., providers would just be recovering costs including return on inveted capital), but patients would have more convenient access since more providers would imply shorter travel times. If the social goal is more concerned with patient welfare than provider welfare, and if the reimbursement price is to be kept at P_0, then free entry would appear to be a desirable policy. Note, however, that permitting free entry would not make costs to the government any less, but it would shift benefits from providers to patients.

A fundamental question, however, is whether price should be kept at P_0 for all sellers i.e., is $150 the "right" price to pay for a dialysis. Alternatives would include (1) raising or lowering P_0 for all providers, or (2) adopting a schedule of prices which pays different providers different amounts.

Figure VI-2

Rents, Production Cost, Reimbursement Rates, and Facility Size



*Includes normal rate of return on invested capital

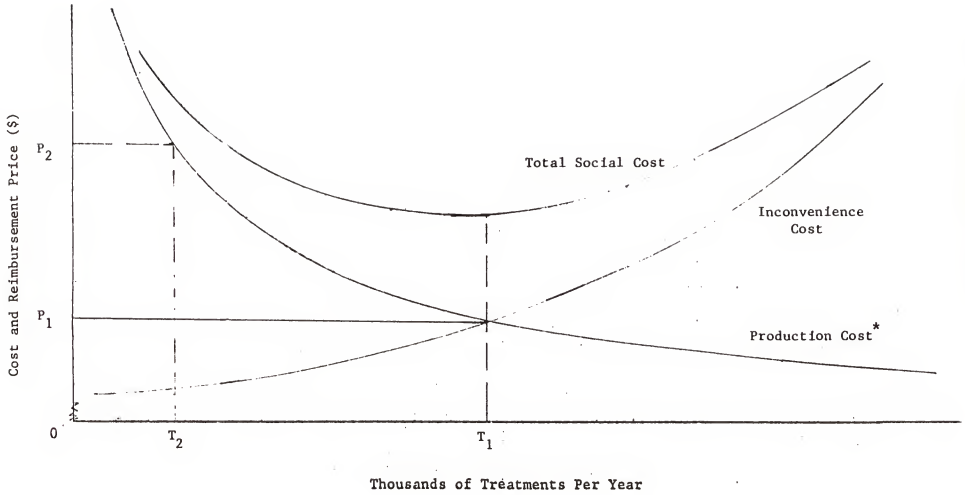
Let us consider the first case. If all providers receive the same amount, what is the "optimal" level of price? It is not a satisfactory answer to say that "price should equal costs," because there is no unique cost. Moreover, with free entry, cost will come to equal price over a wide range of possible values of price. The critical question then is: which cost? With competition, the level of price will determine:

- Program costs (e.g., P_1 X Number of treatments)
- Facility size (e.g., T_1, the breakeven size at P_1 in Figure VI-2)
- Patient convenience (e.g., access and travel time with facilities of size T_1).

How should P be determined? It will obviously reflect a tradeoff between program costs, which are paid by taxpayers, and patient convenience. In choosing P, "society" chooses how convenient it wishes to make dialysis treatments. One definition of the optimal level is one that explicitly tries to compare these magnitudes. As P is reduced, taxpayers gain as production costs fall, but patients have more inconvenience as firm size increases. Curves of production cost (PC) and access or inconvenience costs (IC) are shown in figure VI-3. The vertical sum of these two kinds of costs represents total social costs of dialysis, and represents a balancing of interests of taxpayers and patients. The resultant curve has the characteristic U shape, in spite of the falling production cost curve. Minimizing the social costs of dialysis treatments would imply setting the price for reimbursement at P_1 which would imply the optimum size facility of T_1. Since the IC and production costs will vary from city to city, the optimum size facilities will be different in different places. The current unknown in this discussion is the estimate of IC.

Figure VI-3

Production, "Inconvenience" and Total Social Cost
of Dialysis Treatments



*Includes normal rate of return on invested capital.

In what sense is T_1 an optimum? It is an optimum in the sense that any larger facility would impose costs on patients which would exceed the savings to taxpayers, whereas any smaller facility would cost taxpayers more than it saves patients. Decision makers may prefer to value costs for different groups differently. But that would represent a kind of income redistribution, and an inefficient one at that. For instance, suppose price was set at P_1. Compared to the situation in which price was P_2 taxpayers could have compensated patients for their inconvenience, and had something left over, i.e., at any price between P_2 and P_1, the taxpayer is better off than at price P_2, even if the patient is paid for the inconvenience of travelling further to a larger facility.

This discussion has assumed that price is uniform, which has the implication that, other things equal, facility size would be uniform. But suppose a decision was made by policymakers that facilities should be <u>different</u> sizes, for example, the sizes that networks or other health planners might select. Then an efficient <u>schedule</u> of reimbursement rates, to be applied generally to all facilities, would be one in which the price declined as the <u>approved</u> facility size increased. For instance, it would pay P_1 to facilities of size T_1, P_2 to facilities of size T_2, etc., as shown in Figure VI-3. Such a schedule would have two advantages. (1) It would avoid payment of rents or excessive profits to larger facilities, and (2) it would offer less of an incentive to a facility to try to bend the rules to expand its size or output, since profits per dollar of investment would be independent of facility size. Note, however, that this arrangement would be one in which the payment rate depended on the facility's <u>size</u>, but not on <u>its</u> cost; the rate would be the same for facilities of the same size, so that the inefficiencies associated with cost-based reimbursement would not arise. <u>The discussion also</u>

assumes that planners have good reasons for selecting the set of facility sizes they do.

Finally, a word on marginal cost pricing. The definition of optimal facility size, i.e., that size which minimizes summed average cost, implicitly takes the marginal costs of production and of inconvenience into account, in solving the problem of optimal facility size to produce a given number of dialysis treatments, on the assumption that patients will pay nothing out of pocket. Technically, the fact that the average cost of treatments is falling means that the marginal cost of a treatment is less than average cost. If a social decision had to be made on the number of treatments to be provided, it is this marginal cost which ought to be taken into account. But since the number of treatments demanded per patient per week is fairly well fixed by technology, this does not seem a relevant concern.

Possibly more relevant is a consideration of incentives which patients might face if patients differ in the cost or inconvenience they attach to travel. Then one might want to reward financially those who were willing to travel greater distances to larger facilities, which facilities could have lower cost to the government. The relevant cost here is then the marginal cost at the facility; one would want to induce patients to move from facility A to facility B if the marginal cost in B is lower than the marginal cost in A, and the relevant savings to be divided between patient and government is the difference in marginal costs.

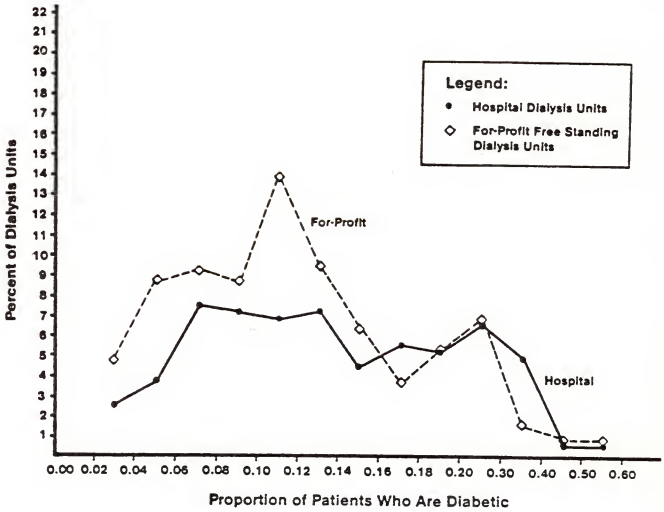


Figure 5. Distribution of Hospital and For-Profit Free Standing Dialysis Units by the Proportion of Patients Who Are Diabetic, U.S., 1977.

U.S. data are less Michigan. Plot omits values less than 0.02 proportion diabetic which is 35.3 for hospitals and 21.5 for for-profit free standing.